REMARKS

Reconsideration of the application in view of the above amendments and the following remarks is requested. Claims 60-72 are in this application. Claims 1-59 have been cancelled. Claims 60-72 have been added in this amendment to alternately claim the present invention. Applicants note that independent claims 60 and 71 appear to read on the embodiments shown in FIGs. 5 and 6, dependent claims 61-65 appear to read on the embodiment shown in FIG. 5, dependent claims 66-70 appear to read on the embodiment shown in FIG. 6, and dependent claim 72 appears to read on the embodiments shown in FIGs. 5 and 6.

The Examiner objected to the drawings because FIG. 7 still includes the label "NXB" although this term has been deleted from the specification. Further, FIG. 7 includes the label "N sink" when the specification refers to the structure as a n-epitaxial or n+ sinker region 250. FIG. 7 has been amended, as shown in red on the attached annotated marked-up drawing sheet of FIG. 7, and as shown in the attached replacement sheet of FIG. 7, to delete the label "NXB" and to change "N sink" to --N+ sinker--.

The Examiner also objected to FIGs. 5 and 6 because there are extraneous vertical lines adjacent to the lower sections of the trench isolation regions. FIGs. 5 and 6 have been amended, as shown in red on the attached annotated marked-up drawing sheets of FIGs. 5 and 6, and as shown in the attached replacement sheets of FIGs. 5 and 6, to remove the vertical lines.

In addition, as the Examiner did not approve the drawings filed with the last amendment, applicants repeat the changes from the last amendment. Specifically, FIGs. 5 and 6 have been amended, as shown in red on the attached annotated marked-up drawing sheets of FIGs. 5 and 6, and as shown in the attached replacement sheets of FIGs. 5 and 6, to add reference labels 53 and 115, respectively, to the "T" shaped trench isolation regions. The specification was previously amended to include mention of the reference labels 53 and 115.

Applicants also propose amending a number of additional features as shown in red on FIGs. 5 and 6, including extending lead lines, changing arrow heads to reference lines, adding a horizontal line to close contacts 90 in FIG. 5, and adding a layer of silicide 122 over poly 1 region 100 shown in FIG. 6. (See page 8, lines 9-10 of the specification regarding the addition of silicide layer 122.) No new matter has been added.

The replacement sheets of FIGs. 5 and 6, which are included in Appendix A along with the annotated marked-up drawing sheets of FIGs. 5 and 6, are to replace the substitute formal sheets of FIGs. 5 and 6 mailed on July 17, 2003 and received by the Office on July 22, 2003. The replacement sheet of FIG. 7, which is included in Appendix A along with the annotated marked-up drawing sheet of FIG. 7, is to replace the substitute formal sheet of FIG. 7 mailed on July 17, 2003 and received by the Office on July 22, 2003.

Thus, the Examiner should have a substitute formal sheet of FIGs. 1, 2, and 3 mailed on July 17, 2003 and received by the Office on July 22, 2003, a replacement sheet of FIGs. 4 and 5, and a replacement sheet of FIGs. 6 and 7 included with this amendment. Applicant respectfully requests the Examiner to confirm the status of the drawings.

With respect to the specification, the Examiner noted that the specification inconsistently refers to region 52. The specification has been reviewed and amended, and is believed to consistently refer to region 52. The Examiner also referred to an amendment to the specification made in the amendment filed on 11/6/2003 (see the fourth full paragraph of page 3 of the 11/6/2003 amendment). This section of the specification has been deleted. In addition, seven paragraphs, which were added in the last amendment, were deleted from page 6, thereby deleting the Summary of the Invention section from the specification. The seven deleted paragraphs are shown stricken through in Appendix B.

The Examiner rejected claims 39-51 and 56-59 under the first paragraph of 35 U.S.C. §112. In addition, the Examiner rejected claims 39-51 and 56-59 under

the second paragraph of 35 U.S.C. §112. Further, the Examiner rejected claim 25 under 35 U.S.C. §102(b) as anticipated by Castrucci et al. (U.S. Patent No. 3,641,516).

The Examiner also rejected claims 25-32 and 52-54 under 35 U.S.C. §103(a) as being unpatentable over Ibi et al. (U.S. Patent No. 5,955,766) in view of Cervin-Lawry (U.S. Patent No. 6,218,722) and Castrucci. In addition, the Examiner rejected claims 25-32 and 52-54 under 35 U.S.C. §103(a) as being unpatentable over Dark et al. (U.S. Patent No. 6,563,189) in view of Cervin-Lawry and Castrucci.

Applicant notes that claims 25-59 have been cancelled, and replaced by new claims 60-72. As a result, applicant will address the above rejections with respect to new claims 60-72.

With respect to new claim 60, this claim recites, in part,

> "a semiconductor material having a surface and a first conductivity type;
> a first region of the first conductivity type located in the semiconductor material, the first region contacting the surface;
> "a second region of a second conductivity type located in the semiconductor material, the second region contacting the surface and being spaced apart from the first region;
> "a third region of the first conductivity type located in the semiconductor material, the third region contacting the surface, being spaced apart from the first and second regions, and lying between the first and second regions, the third region being located such that no region of the second conductivity type lies between the first region and the third region."

Independent method claim 71 recites the same limitations.

Thus, since the third region lies between the first and second regions, a region of the first conductivity type must lie between a region of the first conductivity type and a region of the second conductivity type.

In addition, new claim 60 also recites, in part,

> "a first polysilicon segment that contacts the surface and the first region;
> "a second polysilicon segment that contacts the surface and the second region, the second polysilicon segment being spaced apart from the first polysilicon segment; and
> "a third polysilicon segment that contacts the surface and the third region, the third polysilicon segment being spaced apart from the first and second polysilicon segments, and lying between the first and second polysilicon segments."

Independent method claim 71 recites the similar limitations.

With respect to the rejections under the first and second paragraphs of section 112, applicant notes that claims 60-72 are believed to satisfy the requirements of the first and second paragraphs of section 112.

With respect to the Castrucci et al. reference, there are no structures which can be read to be the third region or the polysilicon segments of claim 60. As required by claim 60, each of the regions (first, second, and third) must contact a polysilicon segment. In addition, the third region must lie between the first and second regions, have the same dopant conductivity as the first region, and have the opposite conductivity as the second region.

As shown in FIG. 4, the Castrucci reference teaches that p-type region 38, n-type region 40, and p-type region 42 are the only regions which contact both the surface and an overlying conductive segment. However, if regions 38 and 42 of Castrucci are read to be the first and second regions, respectively, of claim 60, then center region 40 can not be read to be the third region of claim 60 because center region 40 has a conductivity type that is opposite to the conductivity types of both the first and second regions 38 and 42.

As a result, it is not possible for center region 40 shown in FIG. 4 of the Castrucci reference to have a conductivity type which is the same as the conductivity type of the first region 38 as required by claim 60. Thus, since the Castrucci

reference does not teach a third region as required by claim 60, the Castrucci reference can not anticipate claim 60.

In addition, the Castrucci reference teaches that conductive segments 32, 34, and 36, which contact the surface (see also column 4, lines 25-27), are metal. Claim 60, on the other hand, requires polysilicon segments. Thus, since Castrucci teaches metal segments rather than polysilicon segments, claim 60 can not be anticipated by the Castrucci et al. reference for this additional reason.

With respect to the Ibi reference, there are no structures which can be read to be the third region and the polysilicon segments of claim 60. As shown in FIG. 2 of Ibi, if region 14 is read to be the first region of claim 60, and region 13 is read to be the second region of claim 60, then there is no region which can be read to be the third region. Further, Ibi teaches that left segment 15 and right segment 15, which contact the surface, are metal. Thus, the Ibi reference fails to teach the third region and the polysilicon segments required by claim 60.

With respect to the Cervin-Lawry et al. reference, there is no structure which can be read to be the third region of claim 60. As shown in FIG. 10 of Cervin-Lawry, if p-base 124 is read to be the semiconductor material of claim 60, polysilicon region 118 is read to be the first polysilicon segment of claim 60, a region of p-base 124 that contacts polysilicon region 118 is read to be the first region of claim 60, and polysilicon region 120 is read to be the third polysilicon segment, then there is no structure which can be read to be the third region of claim 60.

N-type emitter region 148, which contacts polysilicon segment 120, can not be read to be the third region because the first region, which was read to be a part of p-base 124, and the third region must have the same conductivity type. Thus, since p-base 124 and n-type emitter region 148 have opposite conductivity types, emitter region 148 can not be read to be the third region of claim 60.

Alternately, if the n-type collector shown in FIG. 10 of Cervin-Lawry is read to be the semiconductor material of claim 60, polysilicon region 122 is read to be the first polysilicon segment of claim 60, the n+ region that lies below and contacts

polysilicon region 122 is read to be the first region of claim 60, then there is no structure which can be read to be the third region of claim 60.

Although emitter region 148 has the same conductivity type as the n+ region that lies under polysilicon segment 122 (read to be the first region), claim 60 requires that the third region be located such that no region of an opposite conductivity type lies between the first region and the third region. As shown in FIG. 10, Cervin-Lawry teaches that a portion of p-base 124 lies between the n+ region (under polysilicon segment 122) and n-type emitter region 148. As a result, there is no region in FIG. 10 of Cervin-Lawry which can be read to be the third region Thus, the Cervin-Lawry reference fails to teach the third region required by claim 60.

With respect to the Dark reference, there are no structures which can be read to be the third region and the third polysilicon segment of claim 60. As shown in FIG. 1E of Dark, if region 107a is read to be the first region of claim 60, and region 107b is read to be the second region of claim 60, then there is no region which can be read to be the third region. Further, since there is no region which can be read to be the third region, there is no region which can be read to be the third polysilicon segment which contacts the third region. Thus, the Dark reference fails to teach the third region and the third polysilicon segment required by new claim 60.

As a result, since neither the Castrucci, Ibi, Cervin-Lawry, nor Dark references teach a third region as required by claims 60 and 71, these claims are patentable over the Castrucci, Ibi, Cervin-Lawry, and Dark references. In addition, since claims 61-70 depend either directly or indirectly from claim 60, and claim 72 directly depends from claim 71, these claims are patentable over the Castrucci, Ibi, Cervin-Lawry, and Dark references for the same reasons as claims 60 and 71, respectively.

The Examiner additionally rejected claims 25-32 and 52-54 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-10 of Dark et al. (U.S. Patent No. 6,563,189) in view of

Cervin-Lawry and Castrucci. Applicant respectfully suggests that the Examiner has misapplied the double patenting rejection.

A double patenting rejection requires that there must be some common relationship of inventorship and/or ownership of the two or more patents or applications. (See MPEP §804.) From what applicant can determine, there is no common relationship between Dark, Cervin-Lawry, and Castrucci. As a result, claims 60-72 are patentable over the double patenting rejection.

Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are respectively requested.

Respectfully submitted,

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APPENDIX A

Annotated Marked-Up Drawing Sheets of FIGs. 5, 6, and 7.

Replacement Drawing Sheets of FIGs. 4, 5, 6, and 7.

APPENDIX B

The following represents the first seven paragraphs of page 6 of applicant's specification that are deleted in the present amendment.

~~A semiconductor device in accordance with the present invention includes a buried layer that has a first conductivity type, and an epitaxial region that is formed on the buried layer. The epitaxial region has a surface and includes a first region and a second region. The first region, which has a first conductivity type, contacts the buried region and the surface. The second region, which has a second conductivity type, contacts the surface and the first region. The second region includes all contiguous regions that have the second conductivity type. In addition, no region of a first conductivity type is enclosed between the second region and the surface.~~

~~The semiconductor device also includes a first conductor that is formed on the surface to make an electrical connection with the first region, and a second conductor that is formed on the surface. The second conductor contacts the second region, and is spaced apart from the first conductor.~~

~~A semiconductor device in further accordance with the present invention includes a semiconductor material that has a surface. The semiconductor material includes a first region of a first conductivity type that contacts the surface, and a second region of a second conductivity type that contacts the surface and the first region.~~

~~The second region includes all contiguous regions that have the second conductivity type. No region of a first conductivity type is enclosed between the second region and the surface. The first region includes a third region that lies vertically below all of the second region, has the first conductivity type, and has a substantially uniform dopant concentration.~~

~~The semiconductor device further includes a first conductor that is formed on the surface to make an electrical connection with the first region. The first conductor has the first conductivity type and a dopant concentration. The dopant concentration of the third region and the dopant concentration of the first conductor are substantially equal.~~

~~The semiconductor device additionally includes a second conductor that is formed on the surface. The second conductor contacts the second region, has the second conductivity type, and is spaced apart from the first conductor.~~

~~The present invention also includes a method of operating a semiconductor device that includes the steps of applying a first voltage to the first conductor, and applying a second voltage to the second conductor. The first and second voltages causing a reverse breakdown of a junction between the first region and the second region such that metal atoms from the layer of metal silicide migrate to form a metallic path through the junction.~~